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Remarks

This Amendment is responsive to the Office Action of February 22, 2006. Reexamination and reconsideration of claims 6 and 34-38 is respectfully requested.

Summary of The Office Action

Claims 6 and 34-38 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Correction or clarification is required.

Claim 6 is rejected under 35 USC102 (e) as being anticipated by Boyle et al. (Pub. No. US 2002/0170891, ser. No. 10/102,703).

Claim 6 is further rejected under 35 USC 102(b) as being anticipated by Baughman et al. (US 5,608,436).

Claims 34-38 were rejected under 35 USC 103(a) as being unpatentable over Hall et al. (US 6,902,867) in view of Boyle et al. (US 2002/0170891, S/N 10/102,703).

Claims 34-38 were rejected under 35 USC 103(a) as being unpatentable over Baughman et al. (US 5,608,436) in view of Boyle et al. (US 2002/0170891, S/N 10/102,703).

The Present Amendment

Claim 6 has been amended to recite the second different removal process also removes debris created by the first substrate removal process and where the feature comprises a fluid-handling slot. No new matter has been introduced by this amendment. Support can be found, for example, at paragraphs [0012] and [0050].

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Claim 34 has been amended to recite where the first substrate removal process comprises using a laser and the second substrate removal process comprises using abrasive particles, and, at least one of the first substrate surface and the second substrate surface being processed by at least one of the removal processes prior to the orifice layer being positioned. No new matter has been introduced by this amendment. Support can be found, for example, at paragraphs [0036-39], [0040], [0049] and [0050].

Claim 35 has been amended to recite "three distinct removal processes". No new matter has been added by this amendment. Support can be found, for example, at paragraph [0065].

Claim 38 has been amended to recite wherein the first substrate removal process comprises using a laser beam and the second substrate removal process comprises directing abrasive particles toward the substrate. No new matter has been introduced by this amendment. Support can be found, for example, at paragraphs [0039-0040].

Rejection of Claims 6 and 34-38 under 35 U.S.C. 112, second paragraph

Claims 6 and 34-38 have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. MPEP section 2173.02 provides:

The test for definiteness under 35 U.S.C. 112, second paragraph, is whether "those skilled in the art would understand what is claimed when the claim is read in light of the specification." *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 806 F.2d 1565, 1576, 1 USPQ2d 1081, 1088 (Fed. Cir. 1986).

Applicants' representative respectfully submits that each of the terms identified in the Office Action as being indefinite would be understood by those skilled in the art when read in light of the specification.

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More specifically, with respect to Claim 6, the Office Action states that it is not understood what the terms "feature", "first profile", "second profile" and "second different process" are and how they are read on the preferred embodiment. The Office Action further states that no such processes and profiles are seen on the drawings and it is unclear how the process can remove the material. The Office Action further states the same is true for "at least two substrate removal processes" of claim 34, "three different removal processes" of claim 35, "process" and "processes" of claim 36, and, "feature" and "process" of claim 38.

Applicants' representative respectfully submits that the term "feature" is well-known in the art as "[m]any micro electro mechanical systems devices utilize substrates having features formed therein." (Present Specification, Paragraph [0001]). "Features can include both blind features and through features." (Paragraph [0001]). A "slot" is an example of a feature. (Paragraph [0012]).

For purposes of explanation, with respect to claim 6, the remaining terms identified in the Office Action as being indefinite will be discussed in view of Figures 7-7d of the present application; however, the terms are not intended to be limited to the example of Figures 7-7d. Figures 7-7d illustrate an exemplary slot formation process. (Paragraph [0055]). In the example description, a circular cutting saw 702 can be utilized in a first removal process. (Paragraph [0055]). Figure 7b shows the result of the act of cutting after the saw is removed from the substrate. (Paragraph [0055]). The act of cutting forms a feature 400d, which in this instance comprises a slot that has a first profile. (Paragraph [0055]).

Fig. 7c shows a second substrate removal process, which in the example includes laser machining. (Paragraph [0060]). Fig. 7d shows substrate material removed by the first and second removal processes to form a slot 305c having a desired configuration in substrate 300c. As can be seen, the slot 305c now has a second different profile when compared to the profile shown in Fig. 7b. (Paragraph [0062]).

Thus, sawing and laser machining are examples of first and second processes that can remove material. Further, a feature 400d with a first profile (shown in Fig. 7b) and a feature

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with second different profile 305c (shown in Fig. 7d) are disclosed in the specification and drawings. The above discussion further applies to the phrases "at least two substrate removal processes" of claim 34, "process" and "processes" of claim 36, as well as "feature" and "process" of claim 38.

Next, claim 34 has been amended to delete the phrase "mechanically conditioned". Accordingly, this rejection is believed to be moot. Similarly, claim 35 has been amended to delete the term "different". As such, this rejection is believed to be moot.

Finally, with regard to claim 38, the Office Action states that it is unclear how the process can remove debris and how this limitation is read on the preferred embodiment or seen on the drawings. The specification provides:

The second removal process can be selected for its own desired characteristics which may or may not be the same as the first substrate removal process. In one such example where the first process is selected for fast substrate removal, the second process may be selected based on precise, controlled substrate removal to finish the slot to a desired profile.

Present Specification, Paragraph [0054].

Further, Fig. 8c illustrates additional substrate material removed. (Paragraph [0065]). In this embodiment, etching can remove debris remaining from the laser machining process and smooth out the slot profile to reduce the potential for cracking of the substrate. (Paragraph [0065]). Thus, the second different substrate removal process, which removes debris created by the first substrate removal process, is disclosed in the specification and drawings.

Based at least on the foregoing, Applicants' representative respectfully submits that each of the terms identified in the Office Action as being indefinite would be understood by those skilled in the art when read in light of the specification. Accordingly, withdrawal of this rejection is respectfully requested.

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The Present Claims Patentably Distinguish Over the References of Record

Independent claim 6

Claim 6 recites a fluid-handling slot formed by a first process and a second different process where the second different process removes additional substrate material from the substrate and also removes debris created by the first substrate removal process. Boyle fails to teach or suggest a fluid-handling slot formed by a first process and a second different process and thus the section 102 rejection is not supported by Boyle since each and every feature of claim 6 is not taught. Further, Baughman fails to teach or suggest a fluid-handling slot formed by a first process and a second different process where the second different process removes additional substrate material and also removes debris created by the first substrate removal process.

Boyle teaches laser machining to form a via. (Boyle, Abstract). Machining may be performed in multiple passes. (Boyle, Abstract). The Office Action relies upon Figures A-B and 1-2 of Boyle. Fig. A illustrates prior art accumulation of debris and molten material at a via outlet. (Boyle, paragraph 6). Typically, the debris cannot be removed by conventional washing techniques. (Boyle, paragraph 6).

Fig. B illustrates a three-step process in which a laser is used to machine a via structure with rough tapered walls. (Boyle, paragraph 12). The sidewalls are then cleaned in a second step. (Boyle, paragraph 12). Finally, an insulating layer is created on the internal via walls in the third step. (Boyle, paragraph 12).

Fig. 1 illustrates laser drilling of a through via. (Boyle, paragraph 108). Fig. 2 illustrates a laser machining system used for via drilling in a controlled gaseous environment. (Boyle, paragraph 109). Boyle fails to teach or suggest a fluid-handling slot formed by a first process and a second different process and thus the section 102 rejection is not supported by Boyle since each and every feature of claim 6 is not taught.

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Claim 6 has also been rejected as being anticipated by Baughman. The Office Action cites Figures 4A-4D of Baughman as teaching claim 6. Applicant respectfully refers to column 5 starting at line 19 where Baughman describes Figures 4A-D and the etching process used. Applicant finds no discussion of a fluid-ejection device formed in a manner to reduce debris. In fact, debris is not even mentioned by Baughman. Therefore, Baughman fails to teach or suggest a fluid-handling slot formed by a first process and a second different process where the second different process removes additional substrate material and also removes debris created by the first substrate removal process.

Since claim 6 recites features not disclosed or suggested by the references, claim 6 patentably distinguishes over the references of record and is now in condition for allowance.

Independent Claim 34

Claim 34 recites a substrate comprising at least a first substrate surface and a second substrate surface, a fluid-handling slot formed by at least two substrate removal processes and extending through the substrate between the first substrate surface and the second substrate surface, where the first substrate removal process comprises using a laser and the second substrate removal process comprises using abrasive particles. Claim 34 further recites a substrate surface processed to reduce an incidence of debris occluding ink flow through individual nozzles. Hall and Boyle individually and/or in combination fail to teach, suggest or make obvious these features. Further, Baughman and Boyle individually and/or in combination fail to teach, suggest or make obvious these features. Thus, claim 34 patentably distinguishes over the references of record.

Hall teaches a method for making ink feed vias. (Hall, Abstract). The ink feed vias 14 are etched through the entire thickness of the semiconductor substrate 32 and are in fluid communication with ink supplied from an ink supply container, ink cartridge or remote ink supply. (Hall, col. 5, lines 7-9). Hall does not teach or suggest a first substrate removal process that comprises using a laser and a second substrate removal process that comprises using

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abrasive particles. Hall further does not teach or suggest a substrate surface processed to reduce an incidence of debris occluding ink flow through individual nozzles.

As discussed above, Boyle teaches laser machining to form a via. (Boyle, Abstract). Machining may be performed in multiple passes. (Boyle, Abstract). The Office Action relies upon Figures A-B and 1-2 of Boyle. Fig. A illustrates prior art accumulation of debris and molten material at a via outlet. (Boyle, paragraph 6). Typically, the debris cannot be removed by conventional washing techniques. (Boyle, paragraph 6). Boyle does not teach a second substrate removal process that comprises directing abrasive particles.

Baughman, as discussed in greater detail above describes an etching process used. Baughman fails to teach or suggest a fluid-handling slot formed by a first process and a second different process where the first substrate removal process comprises using a laser and the second substrate removal process comprises using abrasive particles.

Thus, Hall and Boyle individually and/or in combination fail to teach, suggest or make obvious a first substrate removal process comprises using a laser and a second substrate removal process that comprises using abrasive particles. Further, Baughman and Boyle, individually and/or in combination fail to teach, suggest or make obvious a first substrate removal process comprises using a laser and a second substrate removal process that comprises using abrasive particles.

Accordingly, the section 103 rejections of claim 34 are not supported by Hall, Baughman and Boyle since each and every feature of claim 34 is not taught. Thus, claim 34 patentably distinguishes over the references of record and is in condition for allowance. Further, dependent claims 35-37 also patentably distinguish over the references of record and are in condition for allowance.

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Independent Claim 38

Claim 38 recites a micro electro mechanical systems device comprising a substrate for supporting overlying layers; and, at least one feature formed in the substrate, the feature being formed with at least a first substrate removal process and a second different substrate removal process, wherein the second different substrate removal process also removes debris created by the first substrate removal process and wherein the first substrate removal process comprises using a laser beam and the second substrate removal process comprises directing abrasive particles toward the substrate. Hall and Boyle individually and/or in combination fail to teach, suggest or make obvious these features. Further, Baughman and Boyle individually and/or in combination fail to teach, suggest or make obvious these features. Thus, claim 38 patentably distinguishes over the references of record.

Hall teaches a method for making ink feed vias. (Hall, Abstract). The ink feed vias 14 are etched through the entire thickness of the semiconductor substrate 32 and are in fluid communication with ink supplied from an ink supply container, ink cartridge or remote ink supply. (Hall, col. 5, lines 7-9). Hall does not teach or suggest a first substrate removal process comprises using a laser beam and a second substrate removal process that comprises directing abrasive particles. Hall further does not teach or suggest a substrate surface processed to reduce an incidence of debris occluding ink flow through individual nozzles.

Boyle teaches laser machining to form a via. (Boyle, Abstract). Machining may be performed in multiple passes. (Boyle, Abstract). The Office Action relies upon Figures A-B and 1-2 of Boyle. Fig. A illustrates prior art accumulation of debris and molten material at a via outlet. (Boyle, paragraph 6). Typically, the debris cannot be removed by conventional washing techniques. (Boyle, paragraph 6). Boyle does not teach a second substrate removal process that comprises directing abrasive particles.

Baughman, as discussed in greater detail above, describes an etching process. Baughman fails to teach or suggest a fluid-handling slot formed by a first process and a second different

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process where the first substrate removal process comprises using a laser beam and the second substrate removal process comprises directing abrasive particles toward the substrate.

Thus, Hall and Boyle individually and/or in combination fail to teach, suggest or make obvious the micro electro mechanical systems device recited in claim 38. Further, Baughman and Boyle, individually and/or in combination fail to teach, suggest or make obvious the claimed device.


Accordingly, the section 103 rejections of claim 38 are not supported by Hall, Baughman and Boyle since each and every feature of claim 38 is not taught. Thus, claim 38 patentably distinguishes over the references of record and is in condition for allowance.

Conclusion

For the reasons set forth above, claims 6 and 34-38 patentably and unobviously distinguish over the references of record and are now in condition for allowance. An early allowance of all claims is earnestly solicited.

Respectfully submitted,

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